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**WORK PLAN FOR
CONSTRUCTION AND OPERATION OF AIR SPARGING
REMEDATION SYSTEM
SITE 73
MCB CAMP LEJEUNE, NORTH CAROLINA**

Prepared for:

DEPARTMENT OF THE NAVY
Contract No. N62470-97-D-5000

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TABLE OF CONTENTS

1.0	INTRODUCTION	1-1
1.1	SITE DESCRIPTION.....	1-1
1.2	SITE BACKGROUND.....	1-2
2.0	PRECONSTRUCTION ACTIVITIES	2-1
2.1	PRECONSTRUCTION SUBMITTALS	2-1
2.2	PERMITS.....	2-1
2.3	PROCUREMENT	2-1
2.4	PRECONSTRUCTION MEETING.....	2-2
3.0	DESIGN BASIS AND CRITERIA.....	3-1
3.1	INTRODUCTION.....	3-1
3.2	DESIGN OBJECTIVES	3-1
3.2.1	Basis	3-1
3.3	SELECTED TECHNOLOGY	3-12
3.4	EQUIPMENT AND MATERIALS SELECTION.....	3-12
3.4.1	Horizontal Air Sparging Well And Vent Wells.....	3-1-3
3.4.2	Air Sparge Well Distribution Piping.....	3-13
3.4.3	Air Sparging Compressor-System	3-13
3.4.4	Well And Valuts	3-13
4.0	SYSTEM CONSTRUCTION TASKS AND METHODS.....	4-1
4.1	MOBILIZATION	4-1
4.2	SITE PREPARATION	4-1
4.3	UTILITY CLEARANCES.....	4-1
4.3.1	Well Installation.....	4-1
4.4	PIPING AND WELL HEAD INSTALLATION	4-12
4.5	SITE RESTORATION AND DEMOBLIZATION	4-12
5.0	SYSTEM START-UP.....	5-1
6.0	SYSTEM OPERATION.....	6-1
7.0	TRANSPORTATION AND DISPOSAL.....	7-1
7.1	INTRODUCTION.....	7-1
7.2	CHARACTERIZATION OF WASTE STREAMS	7-1
7.3	WASTE DISPOSAL APPROVAL	7-12
7.4	WASTE PACKING.....	7-13
8.0	REPORTING.....	8-1

TABLES

Table 3.1	Groundwater Remediation Goals
Table 3.2	Key Design Parameters for Air Sparging System

Table 8.1	Remedial Activity Derived Waste
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FIGURES

Figure 1	Vicinity Map
Figure 2	Site Layout
Figure 3	Air Sparging Well and Vent Well Layout
Figure 4	Sparging Radius of Influence
Figure 5	Air Sparging Well Details
Figure 6	Control Panel Details
Figure 7	Well Vault Installation Details

APPENDICES

Appendix A	Health and Safety Plan Addendum
Appendix B	Sampling and Analysis Plan

1.0 INTRODUCTION

This Work Plan presents OHM Remediation Services Corporation's (OHM) approach to implementing the scope of work under Task Order Number 0033 at Navy Atlantic Division (LANTDIV) Contract N62470-97-D-5000. Several other plans have been developed for this Task Order and are considered to be a part of this work plan. They include:

- Site-Specific Health and Safety Plan Addendum
- Sampling and Analysis Plan Addendum

This work plan identifies and describes how OHM will implement the major tasks associated with supplying, installing, operating an air sparging system to remediate hydrocarbon contaminated groundwater at Site 73.

1.1 SITE DESCRIPTION

Site 73 is situated within the boundaries of the Amphibious Vehicle Maintenance Facility located in the Courthouse Bay area of MCB Camp Lejeune. **Figure 1** shows the general site location of Site 73 at Camp Lejeune. The site is roughly bounded by State Route 172 (Sneads Ferry Road) to the north, Courthouse Bay to the South, and unnamed tributaries of Courthouse Bay to the east and West. Courthouse Road, which bisects the study area, is used to enter the complex. The terrain is primarily flat. Stormwater run-off tends to drain directly south to Courthouse Bay. A broad marshy area is associated with the western tributary. Directly north of the site is another large marsh and a stream that discharges north into the New River. The latter marsh is separated from the site by State Route 172, which represents a local topographical high and surface water runoff divide.

The geology in the study area consists of fine to medium grained sand interbedded with 1 to 2 inch silt, or silty-clay seems to a depth of approximately 11.5 ft. below ground surface (bgs). A fat clay layer is present at about 11.5 ft below ground surface and is several feet thick. This clay layer is the aquitard for the surficial aquifer located in the study area. Groundwater occurs at a depth of about 2 to 3 ft bgs in the study area.

The study area consists of numerous buildings, aboveground storage tanks (AST's), underground storage tanks (UST's), vehicle wash racks, and oil/water separators. Most of the USTs are or were located (some USTs have been removed) within the fenced area around Building A47. Non-petroleum type wastes are routinely handled at an active Hazmat Storage

Area located near UST A47/3. Other USTs are or were located near Buildings A1, A2, and A10. A current plan view of the installation area is shown in **Figure 2**.

1.2 SITE BACKGROUND

According to a report submitted by Baker Environmental, Inc., the Amphibious Vehicle Maintenance Facility started operations in 1946 and is still active. Available information indicates that an estimated 400,000 gallons of waste oil was discharged directly onto the ground surface at this facility, primarily near Building A47. In addition to the waste oil, approximately 20,000 gallons of waste battery acid was also reportedly disposed in the area northeast of A47. The waste battery acid was poured into shallow hand-shoveled holes, which were immediately backfilled. Neither area of disposal is visually apparent. Much of the area where waste disposal reportedly took place is covered with concrete, building, and/or roads. A previous report (Law-Catlin, 1993) indicated that solvents may have also been disposed at this site although no specific disposal locations or dates were identified.

References

Law-Catlin Associates, Inc. 1993. *Leaking Underground Storage Tanks, Comprehensive Site Assessment, Building A-47 Pumps, Marine Corps Base, Camp Lejeune, North Carolina*. Draft. December 29, 1993. Volumes I and II.

Baker Environmental, Inc., *Natural Attenuation Evaluation Report. Operational Unit No. 9 (Site 73), Amphibious Vehicle Maintenance Facility, Marine Corps Base, Camp Lejeune, North Carolina*. Draft, February 2000.

Baker Environmental, Inc., *Feasibility Study Operational Unit No. 9 (Site 73), Amphibious Vehicle Maintenance Facility, Marine Corps Base, Camp Lejeune, North Carolina*. Draft February 1997.

Baker Environmental, Inc., *Annual Monitoring Report, Operable Unit 73, Marine Corps Base, Camp Lejeune, North Carolina, Reporting Period July 2000 – June 2001*. Draft: September 2001.

2.0 PRECONSTRUCTION ACTIVITIES

2.1 PRECONSTRUCTION SUBMITTALS

The following plans have been developed for this delivery order and are to be considered as complementary components to this work plan:

- Site-Specific Health and Safety Plan (SHSP) Addendum (included herein as Appendix A)
- Sampling and Analysis Plan (included herein as Appendix B)

Additional reports, certifications, etc. will be submitted in accordance with the submittal register. The original submittal register is located in the Construction Quality Control Plan.

2.2 PERMITS

OHM will prepare all permit applications for submission by the base as required for construction of this remediation system. Permits/registration required for this project include the following:

- Utility clearances
- Base Construction Permit

2.3 PROCUREMENT

Upon submittal of this Work Plan, OHM will initiate procurement of new equipment, materials, and subcontractors necessary for the execution of this project. The major equipment and materials to be procured include:

- Well Vaults
- Air Sparging Hose
- Air Tank
- Fittings and Valves
- Instrumentation

Specialty subcontractors may be procured to execute certain portions of the work. The following is a list of possible services to be subcontracted:

- Drilling
- Laboratory analytical services

- Transportation and disposal for residuals management, if required

2.4 PRECONSTRUCTION MEETING

OHM will participate in a pre-construction meeting at MCB Camp Lejeune with Base, LANTDIV and other parties prior to initiation of construction activities at to the site. OHM representatives will include at a minimum the Project Manager and Site Supervisor. The purpose of this meeting will be to:

- Confirm roles and responsibilities of key personnel and flow of communication for project execution
- Review the project schedule, work hours, sequence of tasks and key milestones
- Identify and discuss Base-specific issues relative to the construction activities
- Obtain the necessary security clearances for operations personnel

3.0 DESIGN BASIS AND CRITERIA

3.1 INTRODUCTION

This section of the Work Plan provides a detailed description of the proposed design, the particular elements of the system, rationale for equipment selection and sizing, supporting calculations, modifications to the technical specifications, and an overall summary of design criteria for construction of the air sparging remediation system at Site 73

3.2 DESIGN OBJECTIVES

The design criteria for the Site 73 remediation Work Plan is to provide the installation of 160-foot long air sparging curtain and air compressor system. Ultimately, the goal of the air sparging system is to prevent vinyl chloride groundwater contamination into Courthouse Bay.

After the air sparging system has been installed and its performance is evaluated, adjustments or improvements will be recommended. The overall site groundwater cleanup goals for the contaminants of concern are presented in **Table 3.1**.

Table 3.1 – Groundwater Remediation Goals		
<i>Contaminant of Concern</i>	<i>Remediation Level (ug/L)</i>	<i>Basis</i>
Trichloroethene (TCE)	2.8	NCWQS
cis-1, 2-Dichloroethene (cis DCE)	70	NCWQS
Trans-1,2-Dichloroethene (trans DCE)	70	NCWQS
Ethylbenzene	29	NCWQS
Xylenes (total)	530	NCWQS
Methyl Tertiary Butyl ether (MTBE)	200	NCWQS
Benzene	1	NCWQS
Ethylbenzene	29	NCWQS
1,2-Dichloroethene	70	MCL
Tetrachloroethene	0.7	NCWQS
1,1,2,2-Tetrachloroethane	0.41	Risk-based RGO (1)
Vinyl Chloride	0.015	NCWQS

Note:

- (1) Based on a carcinogenic target risk level of 1×10^{-6} . The equation used to calculate this RGO is based on guidance in USEPA Region IV Bulletin, November 1995.

3.3 SELECTED TECHNOLOGY

Biosparging has been determined to be an effective technology for remediating hydrocarbon-contaminated groundwater at this site. This remediation system incorporates a network of below grade compressed air sparging which includes a portable compressor system for delivering injection air to the air-sparging well.

3.4 EQUIPMENT AND MATERIALS SELECTION

This section provides detailed information on individual components of the treatment system and the rationale for equipment selection. **Table 3.2** summarizes the key design parameters for the air sparging system.

Table 3.2 – Key Design Parameters for Air Sparging System	
<i>Air Sparging System</i>	<i>Design Parameter/Basis</i>
Depth to water	Approximately 6 to 7 ft bgs
Confining layer	11 ft bgs
Number of vertical wells	18 to 20
Sparge well diameter	1 inch
Sparging screen material	PVC screen (0.01 inch slots)
Well depth	11 to 12 ft bgs (directly over aquitard)
Pressure needed at well head (minimum)	7 psi (OHM calc)
Header piping pressure (minimum)	20 psi (controlled by regulator)
Air sparge pipe and equipment loss	3 psi (OHM calc)
Pressure capacity at compressor	40 psig
Total flow requirements	5-40 scfm. (OHM estimate)

3.4.1 Horizontal Air Sparging Well And Vent Wells

Nineteen vertical air-sparging wells will be installed in the area. These vertical air sparge wells will be injected with compressed air to treat the contaminated groundwater. The air sparge wells will be installed just above the semi-confining layer, to a depth of approximately 11 to 12 feet bgs, using a direct push technology (dpt)-type rig. Given the depth of the confining layer is approximately 12 ft. bgs, an effective air-sparging cone of influence of about 20 would be recognized feet on the land surface.

Ten vent wells will be installed. Refer to **Figure 5 and 7** for details. The vent wells will be capped and have 5 feet of well screen.

3.4.2 Air Sparge Well Distribution Piping

This system is designed as a portable, periodic air sparge system. Air hose will be used as the distribution system. The hose will be placed on the ground and connected to the control panel. Following the event, the hose will be removed.

3.4.3 Air Sparging Compressor-System

An existing Makita model MAC-2200, 2 horsepower (hp) piston air compressor will be used for this application. The compressor can deliver 25 scfm at a maximum pressure of 40 psig.

The control panel (two) will consist of a regulator and ball valve for the common header and a needle valve and rotameter gauge for each well. Hose quick connects will be provided for ease of operation.

3.4.4 Well And Vaults

Each well vault will be rated for H-20 traffic. Refer to Figure 7 for details.

4.0 SYSTEM CONSTRUCTION TASKS AND METHODS

4.1 MOBILIZATION

Equipment and personnel currently on-site will perform this remedial project. Additional support, if needed, will be mobilized to the site as required from other projects at MCB Camp Lejeune, other project sites or regional offices in Covington, Georgia, Alpharetta, Georgia and/or Clermont, Florida.

4.2 SITE PREPARATION

The initial site preparation activities will include the delineation of the job site perimeter and work zones, location of all utilities within the project area, fence removal and temporary fence/barricade installation, set up of temporary facilities, staking or marking the location of the equipment compound, saw-cutting of asphalt and concrete, and securing access to or installing a fenced area at Site 73. Exclusion zones will be established in accordance with the Health and Safety Plan and storage and lay down areas defined. Erosion and sedimentation control measures such as silt fence and hay bale placement will be instituted as required.

4.3 UTILITY CLEARANCES

OHM will contract a local utility locator to provide location services. The utility locator will identify and mark all known utilities potentially within the work zones. OHM will exercise caution while performing intrusive work and will implement its Standard Operation Procedures for excavation or drilling near utilities. Techniques for minimizing damage to existing utilities include the use of location devices, utility location services, and hand digging. OHM's Health and Safety Plan also addresses these concerns.

4.3.1 Well Installation

Vertical airsparging wells will be installed using a DPT-type rig. Borings will be advanced to the top of the confining layer clay (approximately 11 to 12 ft bgs). The DPT rig will push to the confining layer clay using 1 5/8 inch diameter push rods. After pushing to the desired depth, the push rods will be pulled out of the borehole and a piezometer will be installed in the borehole. The piezometer will be constructed with 1-inch diameter, schedule 40, PVC risers with a 1 foot screened interval. The screen will be constructed of schedule 80, PVC slotted screen with 0.01-inch slots. The top of the piezometer casing will be fitted with a cap that contains a quick disconnect-type air compressor fitting.

OHM's field personnel will install the air sparging wells as indicated in **Figures 5 and 7**. Vent wells will also be installed using a DPT-type rig. Borings will be advanced to about 5 ft bgs. The DPT rig will push to the total depth using 1-5/8 inch push rods. After pushing to the desired depth, the push rods will be pulled out of the bench hole and the vent well casing will be installed in the bench hole. The vent well be constructed with a 1-inch diameter, 5 foot long, schedule 20 PVC, well screen. The well screen will contain 0.01" slots. The top of the vent well will be in constructed with a locking well cap, which will be removed during air sparging activities. OHM's field personnel will install the sparging wells as indicated in **Figures 5 & 7**.

4.4 PIPING AND WELL HEAD INSTALLATION

OHM's field personnel will install the air sparging control panel and complete wellheads as indicated on the drawings. All distribution piping will be constructed above-grade. **Figure 6** shows the control panel details.

4.5 SITE RESTORATION AND DEMOBILIZATION

Grass areas destroyed or disturbed during construction will be seeded. OHM will repair asphalt pavement areas and roadway surfaces damaged or destroyed during construction to Base and North Carolina standards. Upon completion of site restoration all equipment and personnel associated with the air sparge installation will be demobilized from the project site.

5.0 SYSTEM START-UP

System start-up and monitoring activities will begin upon final completion of the equipment, piping, wellhead, and electrical generator. This will include testing, calibration, adjustment, and initial maintenance of the compressor and ancillary process equipment and instrumentation. During this time, the system will be placed into operation. Specific start-up and optimization activities include:

- Equipment shakedown (mechanical and electrical)
- Air sparging well development as necessary to prepare for an injection
- Test and calibrate process controls and equipment
- Develop and quantify air flow and pressures to the sparging wells
- Determine air injection breakthrough pressure and develop pressure and flow relationships
- Determine and quantify air injection rates
- Documentation of start-up monitoring parameters for system optimization

6.0 SYSTEM OPERATION

The sparging system will be operated as individual events. The portable compressor, generator and control panel will be brought to the site for each event. Field tests will be used to determine the frequency and length of each event. It is expected that sparge wells 73-AS01 through 73-AS10 will be sparged for 4 hours, followed by 4 hours for sparge wells 73-AS11 through 73-AS19. Because the ground water flow rate is less than 0.001 feet per day, it is expected that the events will be completed on a monthly basis. Vinyl chloride analysis and dissolved oxygen levels will be the key operating indicators. Refer to Appendix B for the Sampling Plan.

- Pressure monitoring to determine air sparging wall influence formational properties
- Ambient monitoring for VOCs at the surface of the trench using a field flame ionization detector (FID) to assess hydrocarbon emissions released from the sparging system

During the operation and monitoring period, OHM will conduct routine maintenance of the system. OHM personnel will visit the site routinely to monitor system performance and maintain the systems in accordance with the plans. During each sparging event, equipment operating parameters and well flow rates and pressure will be logged. The results of the each event will be presented in the Field Test Report per Section 02903 of the specifications that will be included with the Contractor's Closeout Report.

7.0 TRANSPORTATION AND DISPOSAL

7.1 INTRODUCTION

This Materials Handling, Transportation and Disposal Plan (MHTDP) was prepared for use during remedial action activities at Site 73, which is located within the Marine Corps Base, Camp Lejeune, North Carolina.

The MHTDP objective is to specify the methods and procedures to be implemented by ONM to ensure that wastes generated during site remediation activities will be transported, stored, treated, and disposed of in full compliance with applicable federal, state, and local rules and regulations.

7.2 CHARACTERIZATION OF WASTE STREAMS

Waste at this site should be minimal because wells will be installed by direct push. Decontamination water and PPE will be the main waste streams.

OHM will complete characterization and disposal analysis of the waste materials generated from the remedial activities in accordance with Section 02222 of the specifications. For the purposes of this plan, OHM assumes that contaminants of concern are benzene from releases of gasoline and waste oil; and trichloroethene, cis-1,2-dichloroethene, and vinyl chloride from solvent releases.

OHM will collect samples in accordance with the Sampling and Analysis Plan and perform appropriate characterization and disposal analysis of the wastes described in **Table 7.1** during the course of this project. Final characterization and disposal alternatives are contingent upon those analyses. An addendum to this plan will be prepared with that information when it is available.

Table 7.1 - Remedial Activity Derived Waste from Site 73			
<i>Waste</i>	<i>Description</i>	<i>Estimated Quantity</i>	<i>Disposal Method</i>
PPE	Personal protective equipment generated during on-site remedial activity	3 drums	Base landfill
Decontamination water	Decontamination water from equipment cleanup	500 gallons	North groundwater treatment plant at Camp Lejeune, NC

7.3 WASTE DISPOSAL APPROVAL

OHM will assign a T&D Coordinator for this project who will report to the Project Manager as a single point-of contact for all waste management activities. The individual assigned to this project will be familiar with all the applicable portions of RCRA, CERCLA, and SARA regulations, especially 40 CFR 261 (Identification and Listing of Hazardous Wastes). In addition this individual will be familiar with the State of North Carolina regulations related to hazardous and solid waste treatment, storage, disposal, and transportation. This individual will specify analyses needed to identify hazardous wastes. Based on this data and consultations with the Department of Navy representatives, the project T&D Coordinator will assist the Department of Navy in identifying regulated wastes materials. The T&D Coordinator will also be responsible for preparing waste profiles to the selected disposal vendor and to coordinate disposal approvals

Based on the materials identified that will require off-site disposal, it is anticipated that the wastes generated will not be RCRA hazardous pursuant 40 CFR 261. The T&D Coordinator, in consultation with the project manager and procurement personnel, have reviewed potential vendors to pre-qualify transportation and disposal companies based on:

- NOV status
- Ability to handle the wastes identified
- Cost effectiveness of the available transportation and disposal options
- Past experience

7.4 WASTE PACKING

All drummed waste of personal protective equipment (PPE) that is collected in 55-gallon (17H open-top) steel drums will be labeled and logged using OHM's standard drum inventory procedures (see attached Drum Inventory Log presented in the Sampling and Analysis Plan). OHM will maintain these drum logs and a database summary of the type and quantity of wastes generated each day. Appropriate measures will be taken to keep off-site back-up copies of this data as well.

All materials will be accumulated on-site until sufficient quantities are available for shipment of a full load of drums or (20 to 30 cubic yards) of bulk material. Pending quantities of waste, OHM will bulk or package waste in bulk Roll-Off containers for cost effective disposal. OHM will conduct weekly inspections of the temporary waste storage areas. All temporary storage will be in compliance with 40 CFR 262.34 and the applicable North Carolina regulations.

Decontamination water and development water will be stored in drums or storage tanks pending quantity and location of each respective type. OHM plans to be transported to these liquids to the groundwater treatment system at the North Plant.

8.0 REPORTING

Various reporting requirements are described in the project specifications. The following paragraphs discuss the reports OHM plans to prepare during the course of this project. Any other reports not mentioned in this section have not been deemed applicable to this project.

Environmental Conditions Report

Prior to starting any field activities at the project site, a ROICC and OHM representative will tour the site, take photographs and note any existing environmental conditions on or adjacent to the site. This report will be submitted on a contractor's production report form (**Appendix D**) with attachments as may be necessary.

Daily Reporting

OHM will prepare and submit daily Contractor's Production Reports (Exhibit 10.1a to the QC Plan in **Appendix D**) and a Contractor's Quality Control Report (Exhibit 8.1 to the QC Plan in **Appendix D**) each day that field activities are conducted or material is delivered for this project. It is anticipated that the site supervisor will perform the role of site QC manager during all periods when the site QC manager is present at the job site.

As-Built Drawings

The two sets of contract drawings will be maintained at OHM's field offices at Lot 203 MCB Camp Lejeune. These drawings will be updated as required by the project engineer for any deviation that has occurred. Upon completion of field activities, OHM will incorporate all changes into the record drawings for the project. Record drawings will accompany the submission of the Contractor's Close-out Report.

Monthly Status Reports

Monthly status reports in the form and content previously approved by LANTDIV will be submitted by the Program Office. Sections regarding progress, forecast, costs incurred, committed, modifications, waste tracking, government materials tracking will be included. Schedules will be updated and variances explained.

Operation and Maintenance Manual

An operation and maintenance manual will be prepared for the integrated remedial system. It will include sections detailing operating instructions for the various equipment components and preventative maintenance requirements for the system. Another section will deal with corrective maintenance and relevant portions of the site safety plan that will reference safety precautions to be employed while performing system maintenance.

Contractor's Closeout Report

Within 60 days of start-up, OHM will supply a Contractor's Close-out Report that will fully document the construction of the remedial system. This report will contain sections discussing a summary of the action with subsections dealing with submittals, sampling, well construction details and a summary of the field daily reports. Subsequent sections will include a final health and safety report, a summary of record documents, a discussion of field changes and contract modifications and a quality control summary. Appendices to the report will contain Building as-built drawings, photographic documentation and equipment warranties or guarantees, a copy of the testing log, field test reports, the rework items list and the daily QC reports will also be appended to the Close-out Report.

FIGURES

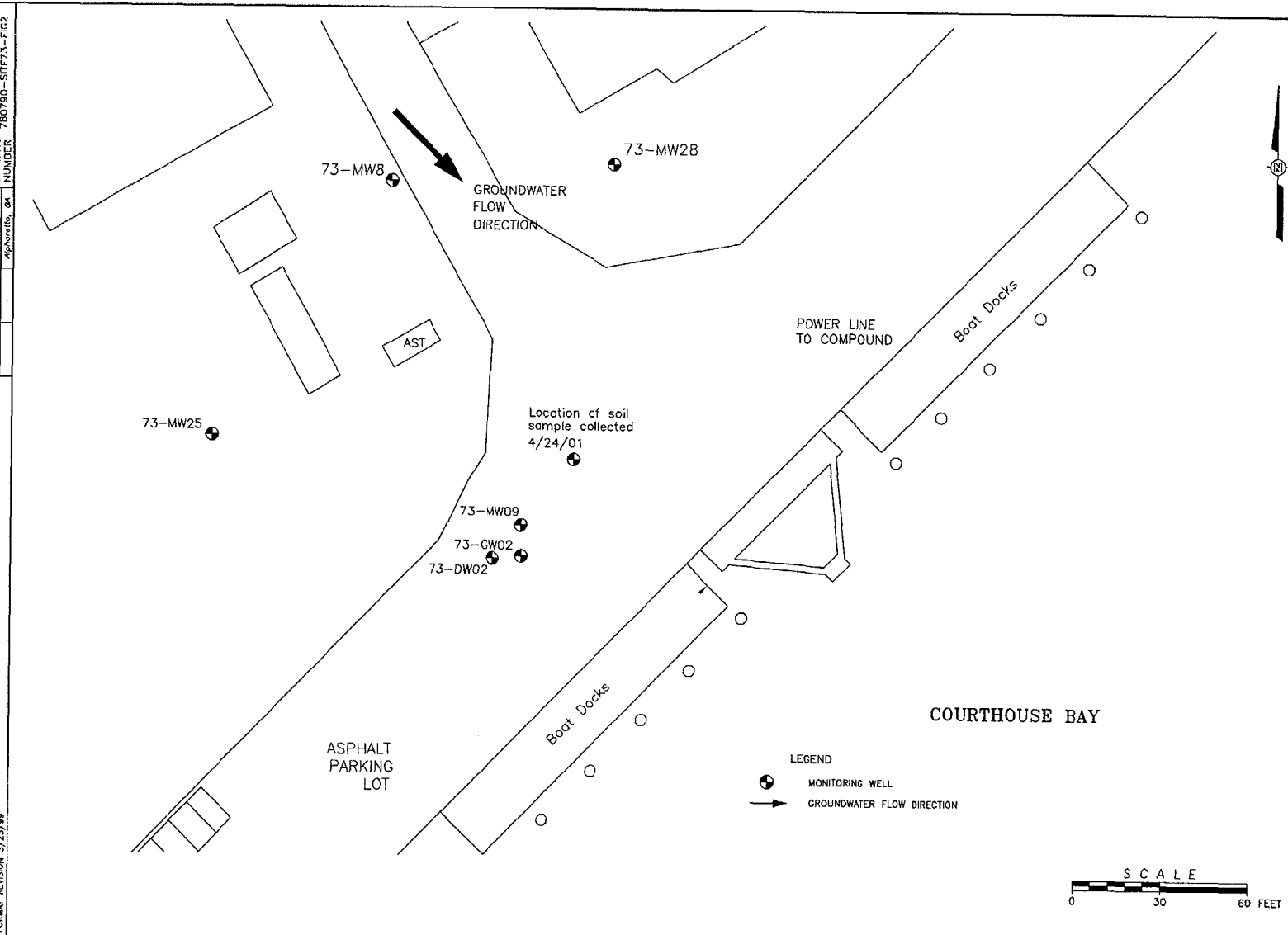
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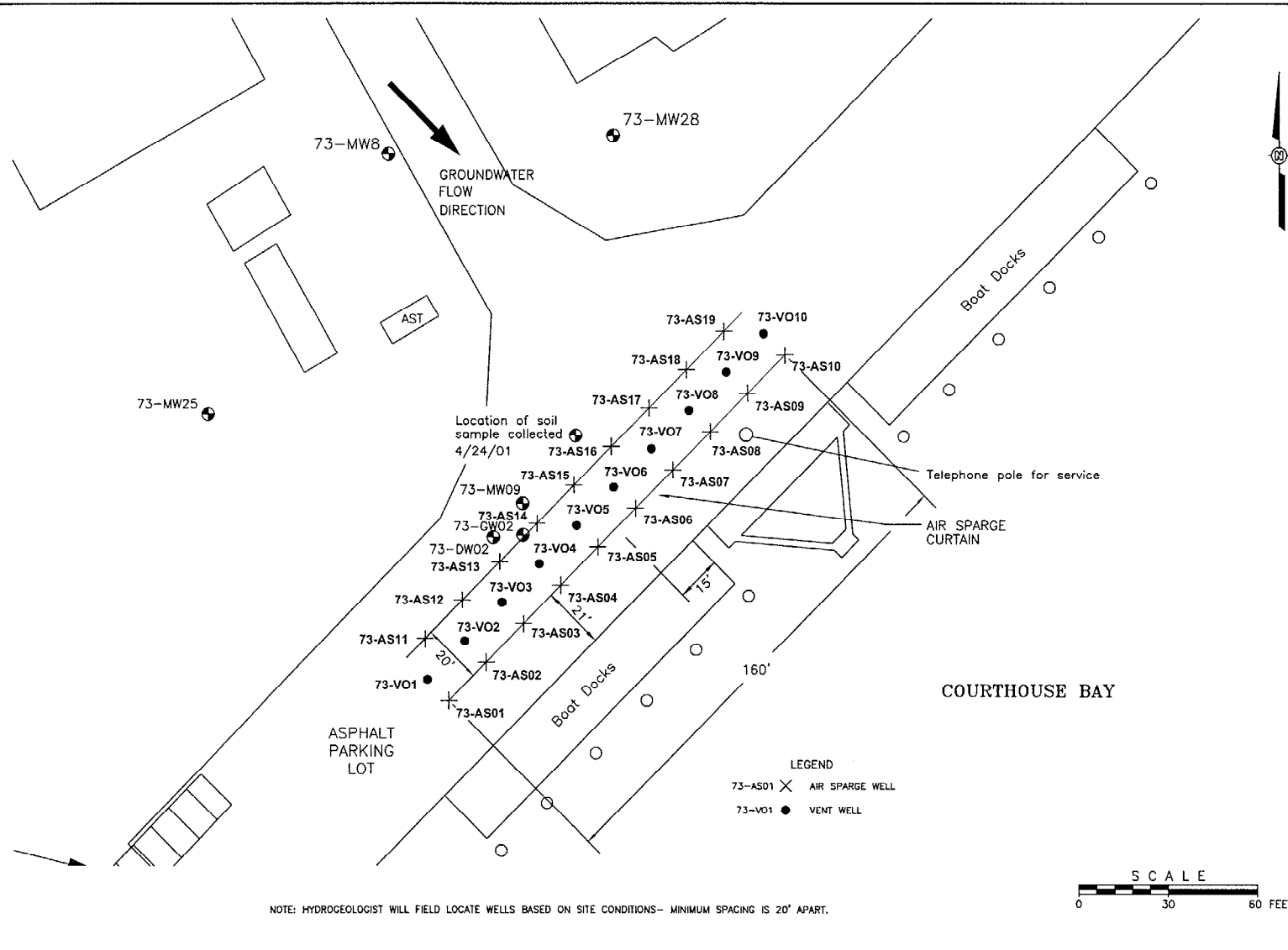
**MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA**

PLOT DATE: 7/1/99
 FORMAT REVISION 3/25/99

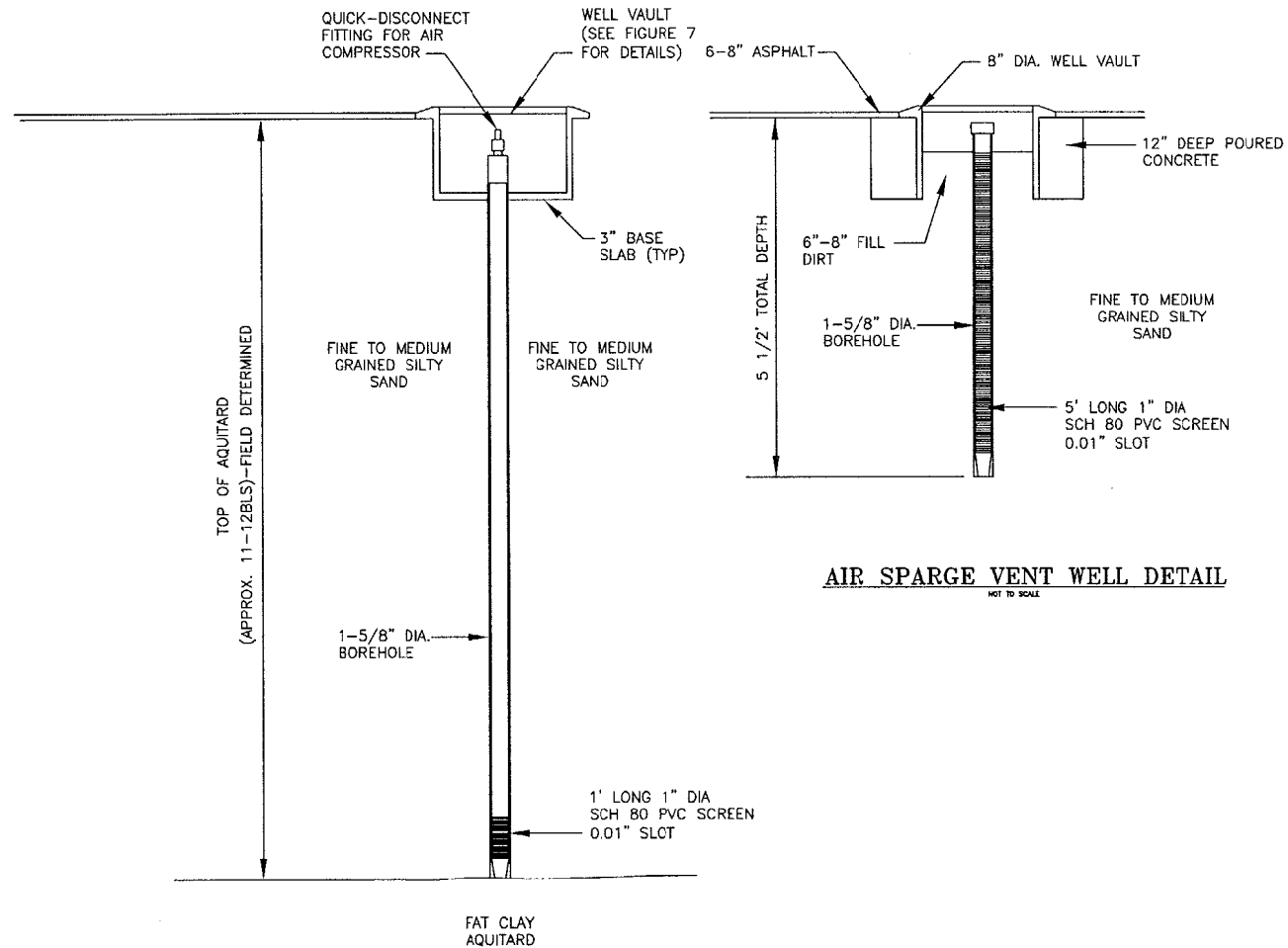
IMAGE X-REF OFFICE DRAWING NUMBER
 780790-SITE73-FIG2



		OHM Remediation Services Corp. PROJECT NO. 780790	
DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY
AIR SPARGING SYSTEM LAYOUT		REVISIONS	
SCALE: AS SHOWN DELIVERY ORDER NO. 0000 COUNTY: GUNTER CO. N82470-97-D-5000 SHEET DRAWING NO. 7		SHEET 1.D FIGURE 2	



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SITE 73		AIR SPARGING SYSTEM LAYOUT	
DRAWING NO. 780790-01-0000		SHEET NO. 3	



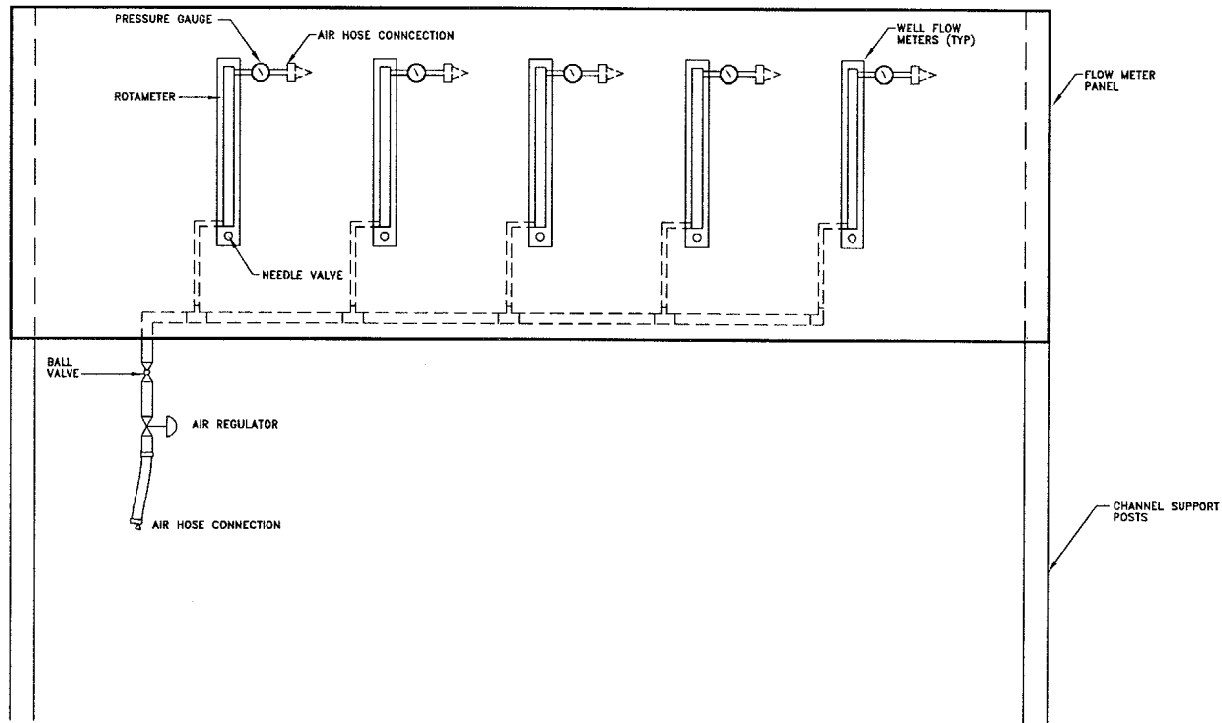
AIR SPARGE VENT WELL DETAIL
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PLOT DATE: 7/7/99
 FORMAT REVISION: 3/25/99

IMAGE: X-REF: ---
 OFFICE: Alpharetta, GA
 DRAWING NUMBER: 780780-SITE73-FIG6



REVISIONS

REV	DATE	BY	DESCRIPTION/ISSUE
1	07/07/99	CHD/MYR	

OHM Remediation Services Corp.
 PROJECT NO. 780780

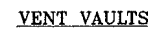
DESIGNED BY: CHD
 CHECKED BY: MYR
 APPROVED BY: CHD


SCALE: AS SHOWN
 DELIVERY ORDER NO.: 0050
 CONTRACT NO.: NS2470-97-D-5000
 SHEET NO.: 7

SHEET I.D.
 FIGURE 6



1. AN OPENING IN THE PAVEMENT SHALL BE REMOVED DURING AIR SPARGE EXCAVATION.
2. A HOLE LARGE ENOUGH FOR THE BASE SLAB AND THE WELL VAULT IS EXCAVATED TO THE APPROPRIATE DEPTH. THE DEPTH TAKES INTO ACCOUNT THE SURFACE CONTOURS. IT IS KEEP ENOUGH SO THAT THE BASE SLAB CAN BE POURED ON A STABLE COMPACTED BASE OF NATIVE SOILS, AND WHEN THE WELL VAULT IS SET ON FINISHED BASE SLAB IT ENDS UP APPROXIMATELY 1/2" ABOVE THE EXISTING GRADE.
3. THE WASHED SAND UNDER THE BASE SLAB ARE COMPACTED AND THE BASE SLAB IS POURED FINISHED AND ALLOWED TO SET. THE SLAB IS POURED AROUND THE RISER PIPES.
4. THE WELL VAULT IS PLACED ON THE BASE SLAB.
5. THE SIDE WALLS ARE FORMED, POURED AND ALLOWED TO SET.
6. THE FORMS ARE REMOVED AND WASHED SAND WILL BE FILLED BACK IN AND COMPACTED AROUND THE VAULT.
7. A CONCRETE APRON IS POURED AROUND THE VAULT AND FINISHED TO PROVIDE A TRANSITION TO THE EXISTING GRADE.



DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ATLANTIC DIVISION NAVAL STATION WAMP CAMP LEONARD		 OHM Remediation Services Corp. PROJECT NO. 760100		REV	DATE	BY	DESCRIPTION/ISSUE
SIGNED: _____ AUTHORITY: _____ DATE: _____		SIGNED: _____ AUTHORITY: _____ DATE: _____		DESIGNED BY	CHECKED BY	APPROVED BY	REVISIONS
SHEET NO. _____ OF _____		SHEET NO. _____ OF _____		WELL MALT INSTALLATION DETAIL			

APPENDIX A

HEALTH AND SAFETY PLAN ADDENDUM

The existing Health and Safety Plan will be used. Activities that will be emphasized are drilling and working with high-pressure air.

APPENDIX B

SAMPLING AND ANALYSIS PLAN

SAMPLING AND ANALYSIS ADDENDUM
Site 73 Air Sparge Curtain
MCB Camp Lejeune, NC

1.0 INTRODUCTION

This document serves as an addendum to the original project Sampling and Analysis Plan (SAP) for Task Order 033 and summarizes the sampling and analytical tasks associated with the installation and operation of the new air sparging curtain scheduled for Site 73, Courthouse Bay. The primary purpose of these data acquisition tasks will be to monitor the effectiveness of the air injection into the subsurface soils and the subsequent degradation of vinyl chloride in site groundwater.

2.0 SAMPLING METHODS

All sampling procedures for groundwater will be conducted according to the original project SAP. Existing monitoring wells will be adequately purged before sampling and ground water samples will be collected using a disposable Teflon bailer. Table A-1 summarizes the sampling tasks identified for the project. Additionally, field parameters including physical properties and nutrients will be analyzed using field techniques.

3.0 ANALYSIS METHODS

All laboratory and field methods utilized will be accepted EPA and State of North Carolina methods. Analysis of groundwater samples will occur at a state certified laboratory for vinyl chloride using EPA method 8260B. Table A-2 presents the QC objectives associated with the method. Additionally field parameters for chemical properties and nutrients will be field analyzed during the sampling event. Table A-1 presents the methods that will be utilized for field analyses.

TABLE A-1
SAMPLING AND ANALYTICAL SUMMARY

Task	Activity	Frequency	Parameter	Method	QC Level	QC Requirements
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On-Site Activities for Air Sparging Remediation System

Construction and Operation of Air Sparging Remediation System	Install ~19 sparge wells	Once	None	None	None	None
	Install ~10 vent wells	Once	None	None	None	None
	Collect soil samples during installation of select wells	Once	Visual determinations for confining layer	None	None	None
	Monitor field parameters on 3 existing wells and 19 new wells	Per event	Water Level	Probe	None	None
			Temperature pH Turbidity Conductivity Dissolved Oxygen	Flow-through Cell	Screening	Calibrate as per manufacturer's instructions
			Nitrate Sulfate Phosphate CO2	HACH kits	Screening	Calibrate as per manufacturer's instructions

TABLE A-1
SAMPLING AND ANALYTICAL SUMMARY

Sample Task	Sample Point	Matrix	Sampling Frequency	Approx Sample No	Sampling Method	Sampling Equipment	TAT	QC Level	Required Analysis	Analytical Method	Holding Time	Sample Preservation
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Fixed-Base Laboratory Activities for Air Sparging Remediation System

Groundwater Monitoring	Monitoring Wells	Water	After Start-up Quarterly (or as needed)	3 + 1 Dup	Grab	Bailer	14 days	IT Maximum	Vinyl chloride	8260B	14 days	HCl pH< 2 Cool to 4°C
	Equipment Rinsate Blank	Water	Per Event	1	Prepared in the Field	Prepared in the Field	14 days	IT Maximum	Vinyl chloride	8260B	14 days	HCl pH< 2 Cool to 4°C
	Trip Blank	Water	1 per VOC cooler	1	Prepared by Lab	N/A	14 days	IT Maximum	Vinyl chloride	8260B	14 days	HCl pH< 2 Cool to 4°C

TABLE A-2
PROJECT QUALITY CONTROL OBJECTIVES

Method No	Analyte / Component	Project Action Limits	Minimum PQL	Accuracy Limits	Precision Limits	Accuracy Limits	Precision Limits	Completeness Limits
				MS/MSD Recoveries	MS/MSD Deviation	LCS Recoveries	Field Dup Deviation	
		Water	Water	Water	Water	Water	Water	Water
VOLATILES BY GC/MS		ug/L	ug/L	%	%	%	%	%
8260B	Vinyl Chloride	NS	2	60-140	<30	36-144	<50	95